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on April 15, 2004 by Inja Yi.

Dated: 4/15/04 By: _____

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For: SEALING MECHANISM FOR A VESSEL WHEREIN MATERIALS ARE ISOLATED AND STORED AND METHOD TO SEAL THE VESSEL

TITLE OF THE INVENTION

Sealing mechanism for a vessel wherein materials are isolated and stored and method to seal the vessel

BACKGROUND OF THE INVENTION

1. Technical Field of the invention

This invention relates to sealing mechanisms for a vessel. Such vessels can preserve products having several raw materials, a refreshing drink for example, in a single vessel by isolating the raw materials from each other until they are mixed when ready to be used. The invention also relates to methods to seal such the vessel.

2. Prior Art

A medicine to be used mixing two agents, a refreshing drink produced by mixing a raw material into a liquid or the like occasionally changes in quality when they have not been used or consumed for a long time after they were mixed, because the mixed agents react or the raw material mixed into the liquid deteriorates under the influence of sunlight or oxygen in the air. Therefore, as a way to preserve these liquids or the like in a condition where the original qualities are kept, a proposed method is such that of providing a receiving chamber for a raw material in a cap seals the vessel including the liquid inside so as the raw material and the liquid to be mixed are isolated and preserved. Then as a means to make the method into practice, the applicant of the present invention proposed a sealing mechanism for a vessel with a cap closure disclosed in Japanese patent application No 2002-238815 (called "the first prior art" below).

This sealing mechanism of the first prior art comprises a cap and a vessel having opening portion, and is characterized in a structure of the cap. Namely, the cap used in the sealing mechanism has a structure wherein a plug portion having a top wall to cover the vessel fits on an outer circumferential surface of the opening portion by an inner surface of a side wall projecting from the top wall along an axis of itself. Further, in the structure, a receiving chamber is formed by a cylindrical wall projecting from the top wall in the

side wall of the plug portion, a seal plug to seal the receiving chamber is arranged to separate from the cylindrical wall by a sleeve loosely fitting on the cylindrical wall. In the case of the sleeve, it is prevented from being pulled out from the vessel by a flexible projecting portion having outer diameter larger than inner diameter of the opening portion. Also the projecting portion has flexibility to allow to pass the inner diameter by bending and subsequently resist backward movement. Then, because of its structure, it can be inserted inside the vessel easily but not be pull out from the vessel after insertion.

As other means to form the receiving chamber for materials in the cap of the vessel, there are bottle caps disclosed in Japanese patent publication No. 2003-2350 (called "the second prior art" below) or Japanese utility model publication No S44-12957, S50-18846 (called "the third prior art" below).

The bottle cap of the second prior art comprising a first portion to be fixed and a removable second portion separably screwed and coupled with each other. Further, the first portion has a through hole on its axis line, and the removable portion has an inner plug portion pierces the through hole. The inner plug portion opens in relating movement of the removable portion to the first portion fixed to the vessel, and the material charged and sealed in the receiving chamber of the inner plug portion is arranged to spout by pressurized gas.

In the case of the bottle cap of the third prior means, a receiving chamber formed in a cap is arranged to be sealed by an inner cap characterized in its structure. Here, the inner cap has a bottom plate being larger in diameter than inner diameter of an opening portion of a vessel and having flexible rim portion. The rim portion of the bottom plate is shaped to hardly bend downward at settled condition. When the cap seals the vessel, the rim portion of the bottom plate of the inner cap inserted with the receiving chamber into the opening portion bents upwardly and shrinks, but as passes the opening portion and reaches to extended wide portion of the vessel it returns to original state and is fixed. When the vessel is opened, while the cap moves upwardly, the inner cap is held inside the vessel as its rim portion of the bottom plate engages to inner surface of the opening portion and is fixed there, but at last the inner cap drops off the receiving chamber and the

receiving chamber opens.

SUMMARY OF THE INVENTION

However, in the both case of the first and second prior arts described above, before the receiving chamber is sealed by the seal plug, some member to open the receiving chamber, namely the first portion or the sleeve, has to be positioned around the receiving chamber and a space is formed between the receiving chamber and the member to open the receiving chamber. Then, in the situation where the cap containing the material dropped and remained in the space is fixed on the vessel, there is a problem bacteria are generated in the space as the liquid flows in the space. Further, because the space between the receiving chamber and the member to open the receiving chamber is narrow, it is extremely difficult to clear the material drops in to the space.

In the case of the third prior art, any member is not positioned around the receiving chamber. However, its structure has to be arranged to suite the shape of the vessel. Especially, in case where the opening portion of the vessel is extremely long or short, there is a problem that it is hardly applied. Further, in case where the rim portion of the bottom plate of the inner cap is made to bent downward too much by production error or other reasons, the inner cap is afraid to stuck in the opening portion as it moves upwardly with the cap when the vessel is opened and to plug the vessel without dropping from there.

Therefore, the present invention aims to provide a sealing mechanism and a method more favorable to provide a receiving chamber for a raw material in a cap seals a vessel including a liquid inside so as the raw material and the liquid to be mixed are isolated and preserved. Namely, such mechanism and method enable to make sealed receiving chamber smoothly opens without positioning any member around it, can be applied regardless of the shape of the vessel, and can release the material stored in the receiving chamber at high reliability without plugging the vessel.

A sealing mechanism relating to the present invention is for a vessel which can be closed by a cap having a plug portion and a seal plug.

The plug portion has a top wall to cover the opening portion of the vessel, a side wall and a cylindrical wall respectively projects from the top wall along an axis of the plug portion. The side wall has an inner circumferential surface arranged to fit on an outer circumferential surface of the opening portion. The cylindrical wall is inside of the side wall and forms a receiving chamber having an opening at its lower end face. The seal plug closes the opening by being fixed to the cylindrical wall and has an outer circumferential portion projecting from an outer circumferential surface of the cylindrical wall.

The vessel has a protruding portion in its opening portion.

The outer circumferential portion of the seal plug is allowed to pass the protruding portion in direction for insertion to the vessel but not for pulling off.

In such a sealing mechanism, because the outer circumferential portion of the seal plug is allowed to pass the protruding portion in direction for insertion to the vessel, the cylindrical wall can be inserted into the opening portion after sealing the receiving chamber by seal plug. Further, because the outer circumferential portion of the seal plug is not allowed to pass the protruding portion in direction for pulling off, the seal plug drops off the cylindrical wall by function of the outer circumferential portion and the protruding portion as the cap moves in direction where its cylindrical wall is to be pulled off the vessel. Therefore, it is possible to make sealed receiving chamber smoothly opens without positioning any member around the receiving chamber.

Further, by using the protruding portion, the opening portion is prevented from plugging with the seal plug and the material stored in the receiving chamber can be released at high reliability without plugging the vessel.

The protruding portion may be formed on an inner surface of a through hole of a sleeve being arranged to be fixed to the opening portion.

In this case, because the protruding portion is formed on the sleeve to be fixed to the vessel, this mechanism can be applied regardless of the shape of the vessel by arranging the sleeve in suitable shape.

The sleeve may have a flange portion arranged to fit on a top surface of the opening

portion on an end portion.

In this case, the sleeve can be easily fixed to the vessel by welding or other method using the flange.

The opening portion may form the vessel by being connected to a storage portion and the protruding portion may be formed on an inner surface of the opening portion.

In this case, because of being a set of the opening portion and the storage portion, out of which set only the opening portion being required to be shaped specially to this mechanism, the vessel keeps to have common shape in the storage portion and can be used in general purpose. Therefore, this mechanism can be applied without strongly influenced by the shape of such the vessel that is not special but can be used in general purpose.

The flanges arranged to be suite each other may be formed on joint portions connect the opening portion and the storage portion.

In this case, the opening portion and the storage portion can be easily connected by welding or other method using the flanges.

The method relating to the present invention use members construct aforesaid first sealing mechanism, namely, the cap and the vessel with the protruding portion arranged to allow the seal plug passing in direction for insertion but not for pulling off. Then the method comprises constructing the vessel, charging a first material in the vessel, and closing the vessel by the cap charged with a second material in its receiving chamber and already sealed with the seal plug.

In such method, a step of positioning some member to open the receiving chamber around the cylindrical wall, namely a step of inserting the cylindrical wall into the vessel having the protruding portion, comes after a step of charging the material into the receiving chamber. Further, because the protruding portion of the vessel is arranged to allow the seal plug passing in direction for insertion but not for pulling off, the seal plug drops off the cylindrical wall by function of the outer circumferential portion and the protruding portion as the cap moves in direction where its cylindrical wall is to be pulled off the opening portion after sealing the vessel. Therefore, it is possible to make sealed

receiving chamber smoothly opens without positioning any member around the receiving chamber. Further, the material dropped around the receiving chamber during charging step can be removed easily and the space between the receiving chamber and the member to open the receiving chamber is prevented from bacteria being generated.

In the method, the vessel is constructed according to the sealing mechanism used there. Namely, a sleeve having said protruding portion on an inner surface of a through hole may be inserted into the opening portion or the opening portion having the protruding portion on its inner surface may be connected to a storage portion in said constructing said vessel.

However, the protruding portion is formed on the inner surface of the opening portion and arranged to allow the seal plug passing in direction for insertion but not for pulling off, and the sealing mechanism using such the vessel that having function to open the seal plug is applied, it is possible to make sealed receiving chamber smoothly opens dispensing with a step of positioning some member around the receiving chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig.1 is a front section showing a vessel, a cap and a sleeve of an embodiment of a sealing mechanism relating to the present invention in a condition where the vessel is opened.

Fig.2 shows the functioning state of the sealing mechanism, Fig.2(a) being a front section of condition before a receiving chamber is opened and Fig.2(b) being a front section of condition after the receiving chamber is opened.

Fig.3 shows a step of charging a first material into a vessel in an embodiment of a sealing method relating to the present invention, Fig.3(a) being a front section of condition before a sleeve is fixed to the vessel and Fig.3(b) being a front section of condition where the first material is being charged into the vessel.

Fig.4 shows a step of charging a second material into the cap in the sealing method, Fig.4(a) being a front section of condition where the second material is being charged into a cap, Fig.4(b) being a front section of condition where a receiving chamber is sealed by a

seal plug and Fig.4(c) being a front section of condition where the second material dropped around the receiving chamber is being removed.

Fig.5 is a front section showing a vessel and a cap of another embodiment of the sealing mechanism relating to the present invention in a condition where the vessel is opened.

Fig.6 shows the functioning state of the sealing mechanism, Fig.6(a) being a front section of condition before a receiving chamber is opened and Fig.6(b) being a front section of condition after the receiving chamber is opened.

Fig.7 shows a step of charging a first material into the vessel in another embodiment of the sealing method relating to the present invention, Fig.7(a) being a front section of condition before an opening portion is connected to the storage portion and Fig.7(b) being a front section of condition where the first material is being charged into a vessel.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In Figs.1 and 2, an embodiment of the sealing mechanism relates to the present invention is shown. Fig.1 is a front section shows the vessel, the cap and the sleeve of the sealing mechanism in a condition where the vessel is opened. Fig.2 shows the functioning state of the sealing mechanism, Fig.2(a) being a front section of condition before the receiving chamber is opened and Fig.2(b) being a front section of condition after the receiving chamber is opened.

This sealing mechanism is for a vessel 2 which can be closed by a cap 1 and has a sleeve 6.

The vessel 2 has an opening portion 3 and the cap 1 has a plug portion 4 and a seal plug 5. The plug portion 4 has a top wall 11 to cover the opening portion 3 of the vessel 2, a side wall 12 and a cylindrical wall 15 respectively projects from the top wall 11 along an axis X of the plug portion 4. The side wall 12 has an inner circumferential surface arranged to fit on an outer circumferential surface of the opening portion 3. The cylindrical wall 15 is inside of the side wall 12 and forms a receiving chamber 14 having

an opening 13 at its lower end face. The seal plug 5 closes the opening 13 by being fixed to the cylindrical wall 15 and has an outer circumferential portion 16 projecting from an outer circumferential surface of the cylindrical wall 15.

The sleeve 6 is arranged to be fixed to the opening portion 3 of the vessel 2 and has a protruding portion 22 on an inner surface of a through hole 21.

The outer circumferential portion 16 of the seal plug 5 is allowed to pass the protruding portion 22 in direction for insertion but not for pulling off.

In such the sealing mechanism, because the outer circumferential portion 16 of the seal plug 5 is allowed to pass the protruding portion 22 in direction for insertion, the cylindrical wall 15 can be inserted into the sleeve 6 after sealing the receiving chamber 14 by seal plug 5. Further, because the outer circumferential portion 16 of the seal plug 5 is not allowed to pass the protruding portion 22 in direction for pulling off, the seal plug 5 drops off the cylindrical wall 15 by function of the outer circumferential portion 16 and the protruding portion 22 as the cap 1 moves in direction where its cylindrical wall 15 is to be pulled off the sleeve 6. Therefore, it is possible to make sealed receiving chamber 14 smoothly opens without positioning any members around the receiving chamber 14.

Further, because the protruding portion 22 is formed on the sleeve 6 to be fixed to the vessel 2, this mechanism can be applied regardless of the shape of the vessel 2 by arranging the sleeve 6 in suitable shape.

Furthermore, by using the protruding portion 22, the sleeve 6 is prevented from plugging with the seal plug 5 and the material 32 stored in the receiving chamber 14 can be released at high reliability without plugging the vessel 2.

The sleeve 6 has a flange portion 23 arranged to fit on a top surface of the opening portion 3 on an end portion.

In this figure, the sleeve 6 can be easily fixed to the vessel 2 by welding or other method using the flange 23.

On the bottom side of the top wall 11, a packing 33 is attached.

In this figure, the vessel 2 can be sealed tightly.

To the under edge of the side wall 12, a cut-ring 34 is connected.

In this figure, as the cap 1 seals the vessel 2, the cut-ring 34 engages to the vessel 2 as showed in Fig.2(a), and it is not able to be opened without cutting a connecting portion 35. Therefore, the cap 1 is prevented from being opened improperly by a third party in distribution step.

The sealing method relating to the present invention can be put into practice by using the vessel 2, the cap 1 and the sleeve 6 with the protruding portion 22 arranged to allow the seal plug 5 passing in direction for insertion but not for pulling off. An embodiment of the sealing method relates to the present invention is explained below referring Figs. 3 and 4. Fig.3 shows a step of charging a first material into the vessel, Fig.3(a) being a front section of condition before the sleeve is fixed to the vessel and Fig.3(b) being a front section of condition where the first material is being charged into the vessel. Fig.4 shows a step of charging a second material into the cap, Fig.4(a) being a front section of condition where the second material is being charged into the cap, Fig.4(b) being a front section of condition where the receiving chamber is sealed by the seal plug and Fig.4(c) being a front section of condition where the second material dropped around the receiving chamber is being removed.

First of all, the sleeve 6 is inserted into the opening portion 3 of the vessel 2. Next, the flange 23 is welded on the top surface of the opening portion 3 by pressing and heating and consequently the sleeve 6 is fixed to the opening portion 3 of the vessel 2. Then as shown in Fig.3(b), the first material 31 is charged into the vessel 2. In this sealing method, though a liquid is charged as the first material 31, the form of the first material is not limited and a powder or a solid also may be charged into the vessel 2.

Besides charging the first material 31, a second material 32 is charged into the receiving chamber 14 of the cap 1. Namely, as shown in Fig.4, the second material 32 is charged into the receiving chamber 14 opening (Fig.4(a)), next, the opening 13 of the receiving chamber 14 is sealed with the seal plug 5 (Fig.4(b)), and then the second material 32 dropped around the receiving chamber 14 is removed by blowing the air (Fig.4(c)). In this sealing method, the order of the step of charging the first material and the step of charging the second material is not limited. Either step may come before, or

both steps may be parallel if facilities or other conditions allow it.

After completion of charging both materials 31, 32, as the last step, the cylindrical wall 15 is inserted into the through hole 21 of the sleeve 6 till the outer circumferential portion 16 of the seal plug 5 engages to the protruding portion 22. Then consequently the vessel 2 is sealed by the cap 1 already sealed by the seal plug 5.

In such the sealing method, a step of positioning the sleeve 6 around the cylindrical wall 15, namely a step of inserting the cylindrical wall 15 into the sleeve 6, comes after a step of charging the material into the receiving chamber 14. Further, because the protruding portion 22 of the sleeve 6 is arranged to allow the seal plug 5 passing in direction for insertion but not for pulling off, the seal plug 5 drops off the cylindrical wall 15 by function of the outer circumferential portion 16 and the protruding portion 22 as the cap 1 moves in direction where its cylindrical wall 15 is to be pulled off the opening portion 3 after sealing the vessel 2. Therefore, it is possible to make sealed receiving chamber 14 smoothly opens without positioning any members around the receiving chamber 14. Further, the material dropped around the receiving chamber 14 during charging step can be removed easily and the space between the cap 1 and the sleeve 6 is prevented from bacteria being generated.

In Figs.5 and 6, another embodiment of the sealing mechanism relates to the present invention is shown. Fig.5 is a front section shows the vessel and the cap of the sealing mechanism in a condition where the vessel is opened. Fig.6 shows the functioning state of the sealing mechanism, Fig.6(a) being a front section of condition before the receiving chamber is opened and Fig.6(b) being a front section of condition after the receiving chamber is opened. In this embodiment, same symbols are used to the portion substantially same as aforesaid embodiment and explanation thereof is omitted or simplified.

This sealing mechanism dispenses with the sleeve 6 of aforesaid sealing mechanism and uses a vessel 20 being a set of an opening portion 3 and a storage portion 7 instead of the vessel 2. The opening portion 3 has a protruding portion 22 on its inner surface. The outer circumferential portion 16 of the seal plug 5 is allowed to pass the

protruding portion 22 in direction for insertion but not for pulling off.

In such the sealing mechanism, because the outer circumferential portion 16 of the seal plug 5 is allowed to pass the protruding portion 22 in direction for insertion, the cylindrical wall 15 can be inserted into the opening portion 3 of the vessel 20 after sealing the receiving chamber by seal plug 5. Further, because the outer circumferential portion 16 of the seal plug is not allowed to pass the protruding portion 22 in direction for pulling off, the seal plug 5 drops off the cylindrical wall 15 by function of the outer circumferential portion 16 and the protruding portion 22 as the cap 1 moves in direction where its cylindrical wall 15 is to be pulled off the opening portion 3. Therefore, it is possible to make sealed receiving chamber 14 smoothly opens without positioning any member around the receiving chamber 14.

Further, because of being a set of the opening portion 3 and the storage portion 7, out of which set only the opening portion 3 being required to be shaped specially to this mechanism, the vessel 20 keeps to have common shape in the storage portion 7 and can be used in general purpose. Therefore, this mechanism can be applied without strongly influenced by the shape of such the vessel 20 that is not special but can be used in general purpose.

Furthermore, by using the protruding portion 22, the material stored in the receiving chamber 14 can be released at high reliability without plugging the vessel 20 with the seal plug 5.

Flanges 24, 25 arranged to be suite each other are formed on joint portions connect the opening portion 3 and the storage portion 7.

In this case, the opening portion 3 and the storage portion 7 can be easily connected by welding or other method using the flanges 24, 25.

The sealing method relating to the present invention can also be put into practice by using the cap 1 and the vessel 20 with the protruding portion 22 formed on the inner surface of the opening portion 3 and arranged to allow the seal plug 5 passing in direction for insertion but not for pulling off. Another embodiment of the sealing method relates to the present invention is explained below referring Fig. 7. Fig.7 shows a step of charging a

first material into the vessel, Fig.7(a) being a front section of condition before the opening portion is connected to the storage portion and Fig.7(b) being a front section of condition where the first material is being charged into the vessel.

First of all, the opening portion 3 is set so as its joint portion 3a comes bottom, and it put on a joint portion 7a of the storage portion 7 as the arrow shows in Fig.7(a). Next, the flange 24 is welded on the flange 25 of the storage portion 7 by pressing and heating and consequently the vessel 20 is constructed by connecting the opening portion 3 and the storage portion 7. Then as shown in Fig.7(b), the first material 31 is charged into the vessel 20.

In the case of the cap 1, a second material 32 is charged into it as same manner as aforesaid first sealing method. Then as the last step, the cylindrical wall 15 is inserted into the opening portion 3 till the outer circumferential portion 16 of the seal plug 5 engages to the protruding portion 22. Then consequently the vessel 20 is sealed by the cap 1 already sealed by the seal plug 5.

In such the sealing method, because the protruding portion 22 is formed on the inner surface of the opening portion 3 and arranged to allow the seal plug 5 passing in direction for insertion but not for pulling off, and the sealing mechanism using such the vessel 20 that having function to open the seal plug 5 is applied, it is possible to make sealed receiving chamber 14 smoothly opens dispensing with a step of positioning some member around the receiving chamber 14.

EFFECT OF THE INVENTION

According to a sealing mechanism relating to the present invention, it is possible to make sealed receiving chamber smoothly opens without positioning any member around the receiving chamber. Further, by using the protruding portion, the sleeve is prevented from plugging with the seal plug and the material stored in the receiving chamber can be released at high reliability without plugging the vessel.

According to the features of claim 2, the mechanism can be applied regardless of the shape of the vessel by arranging the sleeve in suitable shape.

According to the features of claim 3, the sleeve can be easily fixed to the vessel.

According to the feature of claim 4, the mechanism can be applied without strongly influenced by the shape of such the vessel that is not special but can be used in general purpose to some extent.

According to the features of claim 5, the opening portion and the storage portion can be easily connected.

According to a sealing method relating to the present invention of claim 6, it is possible to make sealed receiving chamber smoothly opens without positioning any member around the receiving chamber. Further, the material dropped around the receiving chamber during charging step can be removed easily and the space between the receiving chamber and the member to open the receiving chamber is prevented from bacteria being generated.

According to the features of claims 7 and 8, the method can be applied according to the sealing mechanism used there. Further, as the sealing mechanism using such the vessel that having function to open the seal plug is applied, it is possible to make sealed receiving chamber smoothly opens dispensing with a step of positioning some member around the receiving chamber.

The disclosure of Japanese Patent Application No. 2003-136860 filed May 15th, 2003 including specification, drawings and claims is incorporated herein by reference in its entirety.